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MONTHLY PROGRESS REPORT

COUNTERMEASURES TRANSMITTING SET AN/ALT-22(V)
AND
BARRAGE JAMMER QRC-139A-(T)
MODIFICATIONS TO AN/ALT-6B

Contract AF33(604)38334

LMED Requisition 32634

PERIOD ENDING: 31 AUGUST 1962

Prepared for

AERONAUTICAL SYSTEMS DIVISION
WRIGHT PATTERSON AIR FORCE BASE
OHIO

SEP 18 1962

TISIA

Prepared by

GENERAL ELECTRIC COMPANY
LIGHT MILITARY ELECTRONICS DEPARTMENT
UTICA, NEW YORK

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SECTION I
INTRODUCTION

This report describes the progress made during August 1962 on the development of an L-band oscillator group for the QRC-139A-(T) and AN/ALT-22(V) jamming system. This work includes the development of two essential microwave components, an L-band barrage magnetron and an L-band ferrite load isolator.

The construction and bench testing of QRC-139A-(T) systems and the construction and qualification testing of three L-band AN/ALT-22(V) systems are also part of the program authorized by letter contract AF33(604)38334.

SECTION II

AN/ALT-22(V) AND QRC-139A-(T) MODIFICATION TO AN/ALT-6B (L-BAND)

A. EQUIPMENT DESCRIPTION.

The equipment being procured under contract AF33(604)38334 consists of sixty government furnished AN/ALT-6B equipments modified to the QRC-139A-(T) and AN/ALT-22(V) configurations. Fifty-seven QRC-139A-(T) equipments complete with L-band QRC-139A-1-(T) oscillator groups are to be supplied with deliveries starting in August 1962. Three first article AN/ALT-22(V) equipments complete with L-band oscillator groups are scheduled to be submitted to first article tests during August and September 1962 and the first article systems delivered to the Air Force by 30 September 1962.

The QRC-139A-(T) equipment supplied on this contract will be identical to the QRC-139A-(T) equipment delivered on contract AF33(604)36722 with the exception that the control dials on the control-indicator and magnetron frequency control units will be designed for L-band and the r-f oscillator will have an L-band barrage magnetron and load isolator.

B. PROGRAM STATUS.

The status of the QRC-139A equipment modification is summarized in the following table.

<u>QRC-139A Unit</u>	<u>Total Units Shipped to Date</u>	<u>At Assembly</u>	<u>At Test</u>	<u>Remarks</u>
Power Supply	20		31	
Transmitter	20		33	
Oscillator	20	2	1	41 Isolators Received 24 Magnetrons Received
Control, Magnetron Frequency	20	6	30	
Control Indicator	20	17	21	
Video Board, Part of Transmitter	20		27	29 BX-1202 Noise Tubes Received
Spare Isolators	5			
Spare Barrage Magnetrons	1			

The first article tests which were scheduled to start in August were delayed because of the barrage magnetron problem. An insufficient number of satisfactory magnetrons was received in August to start the tests as planned. First article tests on Samples 1 and 3 will start early in September providing first article barrage magnetrons are available. Temperature-altitude, explosion proof, and some vibration tests will be run on Sample 1. A 250-hour life test and 24-hour stability test will be run on Sample 3. Service condition tests will be run on Sample 2.

Negotiations are underway with the Air Force to conduct a vibration survey on one AN/ALT-22 first article system in order to determine how much vibration the equipment will withstand without failing, and to pinpoint the areas where failures will occur. Based on the results of this survey, recommendations can be made regarding ways and means of fixing the equipment so that it will withstand vibration tests conducted in accordance with MIL-T-5422 (modified). If the Air Force approves the planned survey early in September, this vibration test will be run on Sample 2. Barry shock mounts built to Boeing specifications have been received for use in this program. The AN/ALT-22 power supply and transmitter with the L-band oscillator installed will be mounted on these shock mounts during part of the vibration survey. The vibration survey datataking and analysis, and report writing will require six weeks.

Parts required for the modification program, with the exception of the L-3519 barrage magnetron, are being received in large enough quantities to meet the production schedules. The barrage magnetron remains a problem area. (See paragraph C. of this section.) The quantities of noise tubes, load isolators, and barrage magnetrons which have been received are tabulated in the Remarks column of the table on page 3. The BX-1202 noise tubes are now being delivered in accordance with the requirements of G-E Drawing No. 7060620, Revision A (see Appendix A) with the exception that the requirements of notes 9 and 12 of this specification have been waived until such time as the necessary life test data and shelf life data can be accumulated to determine that these requirements are realistic. The BX-1202 beam switching tube is a new noise source. It is being used as a noise generator for the first time on this contract. For this reason, little is known of its life expectancy or

shelf life characteristics. The Burroughs Corporation has agreed to accumulate some data so that these tube characteristics can be included as part of the purchase specification.

C. PROBLEM AREA.

The barrage magnetron is still the only item limiting the delivery of L-band QRC-139A-(T) systems to the Air Force. Litton did not deliver as many tubes as expected during August due to a low yield situation. The low yield during the first part of the period was caused by slumping and narrow spectrum bandwidth. To improve the yield, several changes were made inside the magnetron. To eliminate the slumping problem, the spacing of the pole pieces from the filament was increased to eliminate possible out-gassing from the pole pieces due to the heat from the filament. To increase the spectrum bandwidth, the coupling to the r-f resonant circuit was increased. These changes were made in the tube design about the middle of the report period and failures due to slumping and narrow bandwidth were reduced significantly. However, with the increased coupling, another problem developed in that the tubes received late in August exhibited a strong tendency to mode at the high frequency end of the tuning range. Litton has been advised of this situation and the General Electric Company will work closely with Litton to resolve this new problem which is reducing the yield from 50 percent to less than 30 percent.

D. PROGRAM FOR NEXT INTERVAL.

The program for the next interval will consist of conducting first article tests on the three AN/ALT-22 (L-band) systems and the assembly and test of at least 27 QRC-139A-(T) systems. The barrage magnetron problem will have to be resolved early in September if the scheduled September deliveries are to be accomplished.

E. FINANCIAL STATUS.

The following is an estimate of the monies that have been expended and committed on Contract AF33(604)38334 as of 31 August 1962:

Expenditures for Engineering Material, Design Effort, Direct Labor, Direct Materials and Support Effort	\$264,361
Gross Commitments and Estimated Liability	\$257,400
Total Expenditures and Commitments	\$521,761

F. OTHER PROJECT ACTIVITY.

Engineering and Material Procurement personnel visited Litton Industries to convince them to build more tubes per day since the tube yield was lower than anticipated. As a result of this trip, Litton agreed to increase their tube starts from three per day to four per day. Additional trips to Litton will be required until an even flow of L-3519 barrage magnetrons from Litton to G.E. has been established.

APPENDIX A

BX-1202 NOISE TUBE SPECIFICATION

(G-E Drawing No. 7060620, Rev. A)

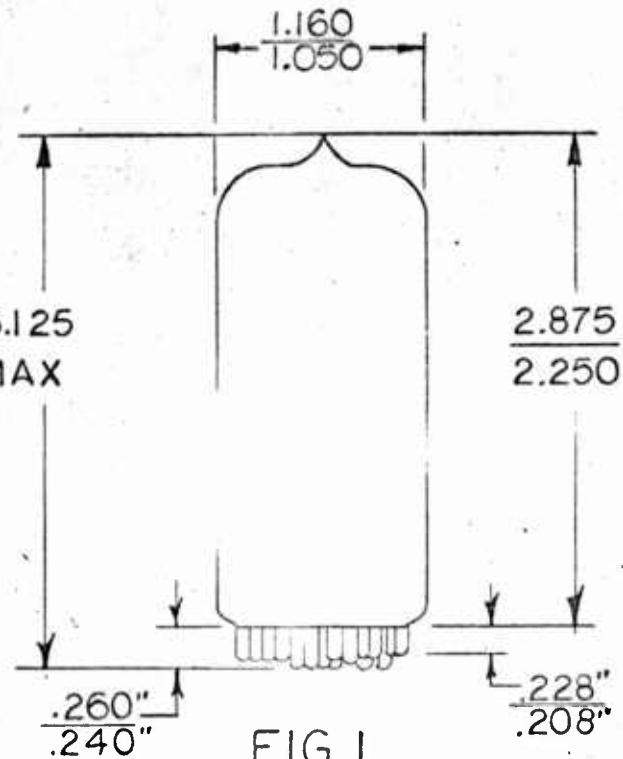
REV.
NO. A
A 7060620

TITLE
ELECTRON TUBE

CONT ON SHEET 2 SH. NO. 1 OF 10

FIRST MADE FOR

REVISIONS



$\pm .002$
26 PINS .040
DIA

PIN 18 OMITTED



ORIGINAL SOURCE OF
SUPPLY
BURROUGHS CORP.
PLAINFIELD, N.J.

BOTTOM VIEW OF TUBE

FIG. 2

VENDOR'S IDENT. NO.
BX 1202

+ FSC/GE 596045



SPECIFICATION CONTROL DRAWING

MADE BY
Kathy Stadt May 31, '62
ISSUED June 4, 1962
FF-B03-W2-P

APPROVALS
b. William
6/5/62

LME
UTICA, N.Y.

DIV. OR
DEPT.

LOCATION CONT. ON SHEET

SH. NO.

CODE IDENT. NO. 99971

G

REV NO.	A	7060620
CONT ON SHEET		3
SH. NO.		2

TITLE
ELECTRON TUBE
FIRST MADE FOR

SPECIFICATION, ELECTRON TUBE TYPE BX 1202

THIS SPECIFICATION IS BASED ON THE LATEST ISSUE OF MILITARY SPECIFICATION MIL-E-1.
ALL PARAGRAPH REFERENCES ARE TO MIL-E-1.

DESCRIPTION: WIDE BAND NOISE GENERATING, INTERNAL MAGNETS, HIGH VACUUM.

RATINGS:	E_F	E_D	E_{DS}	I_K	E_{BS}	E_{BK}	E_{IS}	$Amb\ T$ (NOTE 1)
UNITS:	V	V	V	mA	V	V	V	°C
MAX:	6.9				340	+100	+100	+85
MIN:	5.7				260	-100	-100	-65
TEST CONDITION	6.3	110	172		300			-55 OPERATING

DIMENSION: SEE FIGURE 1

BASE: BUTTON 26 PIN, 10+1 WITH BURROUGHS TUBE SOCKET SK100 PER
DRAWING B7439457P1 SEE FIGURE 2.

PIN CONNECTION: SEE FIGURE 3

TEST CIRCUIT: NOTE 3

MADE BY
KATHY STADT EFK
ISSUED JUNE 6, 1962

APPROVALS
G. WILBURNS
C/5/62

LME
UTICA, N.Y.

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LOCATION CONT ON SHEET

SH. NO.

FF-801-W2-P

CODE IDENT NO. 99971

P
PRINTS TO

A	28/14/1962	REVISED	
A	T. W. [initials]	REPLACED	

REV NO.	A
A 7060620	
CONT ON SHEET	4
SH NO.	3

TITLE

ELECTRON TUBE

CONT ON SHEET

SH NO. 3

FIRST MADE FOR

FOR MISCELLANEOUS REQUIREMENTS, SEE PARAGRAPH 3.3, INSPECTION INSTRUCTIONS
FOR ELECTRON TUBES.

PARA NO. TEST CONDITIONS AQL INSP % DEF LEVEL SYM LIMIT UNITS MIN MAX

4.9.18.1.8 **CONTAINER DROP (1) PACKAGE GROUP 1

CARTON SIZE
4.125X1.812X2.182 MAX

4.9.6.3 **GLASS STRAIN

4.9.10 **TEMPERATURE CYCLING NOT OPERATING
5 CYCLES**VIBRATION 10 TO 55 CPS AT 0.05"
TOTAL EXCURSION. 55 TO
2000 CPS AT $\pm 5\%$ OPERA-
TION. 10 TO 2000 TO
10 CPS IN 2 MINUTES.
15 MINUTES EACH PARALLEL
AND AT RIGHT ANGLE TO
MAJOR AXIS OF TUBE.
NON-OPERATING.

**SHOCK

15G $\pm 10\%$, 11 ± 1 MS
DURATION ALONG MAJOR
AND MINOR AXIS, NON-
OPERATING 3 SHOCKS
IN EACH DIRECTION

4.10.4.1 ANODE CURRENT

4.10.4.5 TARGET CURRENT

--- - - - LAGGING SPADE
CURRENT--- I_2 --- .5' MA DC--- I_{T2} (NOTE 1) 7.0 MA DC--- I_S (NOTE 1).5 MA DC

REVISIONS	
<i>Aug 4, 1962</i>	
<i>A 286WINGO RETRACED</i>	
<i>K. Maher REVISED</i>	

PRINTS TO

MADE BY KATHY STADT EJK	MAY 31, 62	APPROVALS E. WILBURNS
ISSUED	JUNE 6, 1962	6/5/62

FF-803-W2-P

2

LOCATION CONT ON SHEET

SH NO.

CODE IDENT NO. 99971

G

A-4

REV NO.	A
7060620	
CONT ON SHEET	5
SH. NO.	4

TITLE
ELECTRON TUBE

CONT ON SHEET 5

PARA NO.	TEST	CONDITIONS	AQL % DEF	INSP LEVEL	SYM	LIMIT MIN MAX	UNITS	REVISIONS		
								I _f	I _{hk}	I _{hk}
4.10.8	*HEATER CURRENT				I _f	135	165	MA		
4.10.15	*HEATER-CATHODE LEAKAGE	E _{hk} = +100V E _{hk} = -100V			I _{hk}	-	20	μA DC		
---	**NOISE OUTPUT(1)	NOTES 2,3,4,6,10			I _{hk}	-	20	μA DC		
---	**NOISE OUTPUT(2)	NOTES 2,3,4,7,10								
---	**NOISE OUTPUT(3)	NOTES 2,3,4,5,8,10								
---	NOISE OUTPUT(4)	F = 5 MC F = 7.5 MC F = 10 MC F = 15 VAC E _b = 260 VDC		1.0	I _f	96	96	DB ABOVE 1μV/MC		
---		NOTES 2,3,4,8,10				96	96			
---	NOISE OUTPUT(5)	F = 3 MC F = 5 MC F = 10 MC F = 12 MC F = 15 MC F = 20 MC E _f = 5.7 VAC E _b = 260 VAC			I _f					
---		NOTES 2,3,4,8,10,11								
4.11	LIFE TEST	GROUP D			t					

MADE BY
KATHY STANT FJK
ISSUED JUNE 6, 1962

APPROVALS
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6/5/62

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CONT ON SHEET

SH. NO.

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Aug. 1962
A 285W160 REVISED &
T. W. ANDREW RETRACTED

G CODE IDENT NO. 99971

A-5

REV NO.	D
A	7060620

TITLE

ELECTRON TUBE

CONT ON SHEET

6

SH. NO. 5

CONT ON SHEET 6 SH. NO. 5

FIRST MADE FOR

REVISIONS

PARA NO.	TEST	CONDITIONS	ACL % DEF LEVEL	INSP SYM	LIMIT	UNITS		
							MIN	MAX
4.11.4	LIFE TEST	F = 5 MC END POINTS	95 -	DB ABOVE 1μV/MC				
		F = 7.5 MC	95 -					
		F = 10 MC	95 -					
		TARGET CURRENT						
		ANODE CURRENT						
		E _{bb} 300 VDC						
		E _f 6.3 VAC						
		NOTES 2,3,4,5,9,10						

Rev A 062
2856W1V60 REVISED
A T. H. M. 4/12
PRINTS TO

MADE BY MAY 31, 62
KATHY STADT FJK
ISSUED JUNE 6, 1962
FF-803-W2-P

APPROVALS
G. WILBURN
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6/1/62

6/1/62

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UTICA, N.Y. LOCATION

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CONT ON SHEET

SH. NO.

G

CODE IDENT NO. 99971

A-6

REV NO. A	TITLE	
A 7060620	ELECTRON TUBE	
CONT ON SHEET 8	SH. NO. 7	FIRST MADE FOR
		REVISIONS

OUTPUT ATTENUATOR" TO GET READING ON LARGE METER AND WITH "ADD TO IMPULSE GENERATOR OUTPUT" CONTROL ADJUST LARGE METER TO 10 DB, READ NOISE OUTPUT ON "IMPULSE GENERATOR OUTPUT ATTENUATOR" PLUS 20 DB PLUS SMALL METER. THIS REPRESENTS THE NOISE OUTPUT OF THE TUBE IN DB ABOVE 1 MICROVOLT PER MEGACYCLE.

NOTE 5 THE NOISE OUTPUT SHALL REMAIN FLAT WITHIN 3 DB AND SHALL NOT FALL BELOW 96 DB ABOVE 1 μ V/MC AT THE THREE TEST FREQUENCIES WHEN THE ANODE VOLTAGE IS INCREASED TO 117 VOLTS AND DECREASED TO 105 VOLTS. THE LAGGING SPADE VOLTAGE MAY BE ADJUSTED FOR OPTIMUM AT EACH OF THE TWO CONDITIONS.

NOTE 6 TAKE REFERENCE READINGS AT 5, 7.5 AND 10 MC AT TEST CONDITION (1) $E_f = 6.9V$, $E_{bb} = 340V$, $E_{AS} = 176V$. WHEN TESTED AGAIN AT THE ABOVE FREQUENCIES AND TEST CONDITION (2) $E_f = 5.7V$, $E_{bb} = 260V$, $E_{AS} = 170V$, THE NOISE OUTPUT SHALL NOT (A) DECREASE MORE THAN 2 DB IF IT DECREASES (B) INCREASE MORE THAN 4 DB IF IT INCREASES, (C) FALL BELOW 96 DB ABOVE 1 μ V/MC.

THE ANODE VOLTAGE MAY DEVIATE FROM 110V, DUE TO VARIATIONS IN THE ANODE SUPPLY.

NOTE 7 WITH THE LAGGING SPADE VOLTAGE (E_{1s}) ADJUSTED PER NOTE 8, THE NOISE OUTPUT SHALL BE FLAT WITHIN 3 DB OVER THE BAND OF 5 TO 10 MC WHEN MEASURED AT 1 MC INCREMENTS.

NOTE 8 WITH THE LAGGING SPADE VOLTAGE (E_{1s}) ADJUSTED TO GIVE OPTIMUM NOISE AMPLITUDE AND QUALITY, THE NOISE OUTPUT SHALL BE FLAT WITHIN 3 DB AT THE TEST FREQUENCIES OF 5, 7.5 AND 10 MC.

APPROVED BY
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03/21/62
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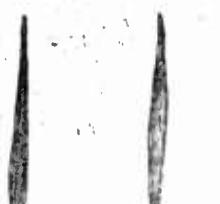
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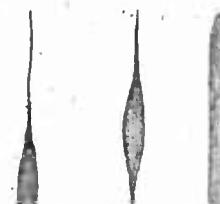
REVISIONS

NOTE 9 WHEN OPERATED CONTINUOUSLY OR INTERMITTENTLY FOR AN "ON" TIME OF 500 HOURS, THE OUTPUT SHALL NOT BE LESS THAN SPECIFIED. LAGGING SPADE VOLTAGE (E_{15}) MAY BE ADJUSTED AT NOT LESS THAN 100 HOUR INTERVALS OF OPERATING TIME TO COMPENSATE FOR TUBE AGEING CHARACTERISTICS. NOISE OUTPUT SHALL BE FLAT WITHIN 3 DB AT THE TEST FREQUENCIES.

NOTE 10 THE NOISE SHALL BE OF GOOD QUALITY. NOISE QUALITY SHALL BE DETERMINED BY OBSERVING AN OSCILLOSCOPE TRACE IN THE UNSWEPT MODE OF OPERATION. THE OSCILLOSCOPE SHALL HAVE A BANDPASS OF AT LEAST 10 KC TO 10 MC TO THE 3 DB DOWN POWER POINTS. THE SHUNT CAPACITY PRESENTED TO THE NOISE TUBE BY THE OSCILLOSCOPE INPUT CIRCUIT SHALL BE A MAXIMUM OF 14 PF AND THE IMPEDANCE SHALL BE AT LEAST 10 MEGOHMS. THE FOLLOWING OSCILLOSCOPE PATTERNS SHALL INDICATE CHARACTERISTICS OF GOOD AND POOR QUALITY NOISE.



GOOD QUALITY



POOR QUALITY

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REV NO.	TITLE		CONT ON SHEET 10 SM NO. 9		
A	ELECTRON TUBE				
CONT ON SHEET 10 SM NO. 9		FIRST MADE FOR			REVISIONS

SPEEDS OF .1, 1, 10 AND 100 μ SEC/CM. AS AN AID IN DETERMINING NOISE QUALITY, BURROUGHS SPECIFICATION PB426, DATED 7/12/62, REVISION 0, TITLED "NOISE OUTPUT QUALITY MEASUREMENTS OF THE TYPE BX1202" MAY BE USED.

FIFTY (50) OHM TERMINATING RESISTOR FOR EMPIRE DEVICES INC., MODEL NF 105, MAY BE REMOVED FROM TEST CIRCUIT FOR EASE OF VIEWING NOISE QUALITY.

NOTE 11 WITH THE LAGGING SPADE VOLTAGE (E_{23}) ADJUSTED PER NOTE 8, THE NOISE OUTPUT AT 3 MC SHALL NOT BE MORE THAN 4 DB GREATER THAN AT 5 MC. WITH 10 MC AS A REFERENCE LEVEL, THE NOISE OUTPUT AT 12 MC SHALL NOT BE MORE THAN 4 DB GREATER NOR MORE THAN 15 DB GREATER AT 15 AND 20 MC.

NOTE 12 THE TUBE SHALL HAVE A SHELF LIFE OF AT LEAST 18 MONTHS WHEN STORED UNDER AMBIENT TEMPERATURES NOT TO EXCEED +85°C AND RELATIVE HUMIDITY CONDITIONS NOT TO EXCEED 90 PER CENT.

NOTE 13 THE TUBE SHALL GENERATE SATISFACTORY NOISE OUTPUT AS DEFINED BY TEST LIMITS AND NOTES WHEN OPERATED OVER THE RANGE OF CONDITIONS SPECIFIED IN THE NOTES.

2

PRINTS TO

MADE BY Thomas E. Nelson ISSUED Aug. 14, 1962 FF-803-W2-P	7-27-62 APPROVALS H. Willburn 8/13/62	LME UTICA, N.Y.	DIV OR DEPT. LOCATION CONT ON SHEET	SM NO.
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G CODE IDENT NO. 99971

A-10

REV.
NO.
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TITLE

ELECTRON TUBE

FIRST MADE FOR

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REVISIONS

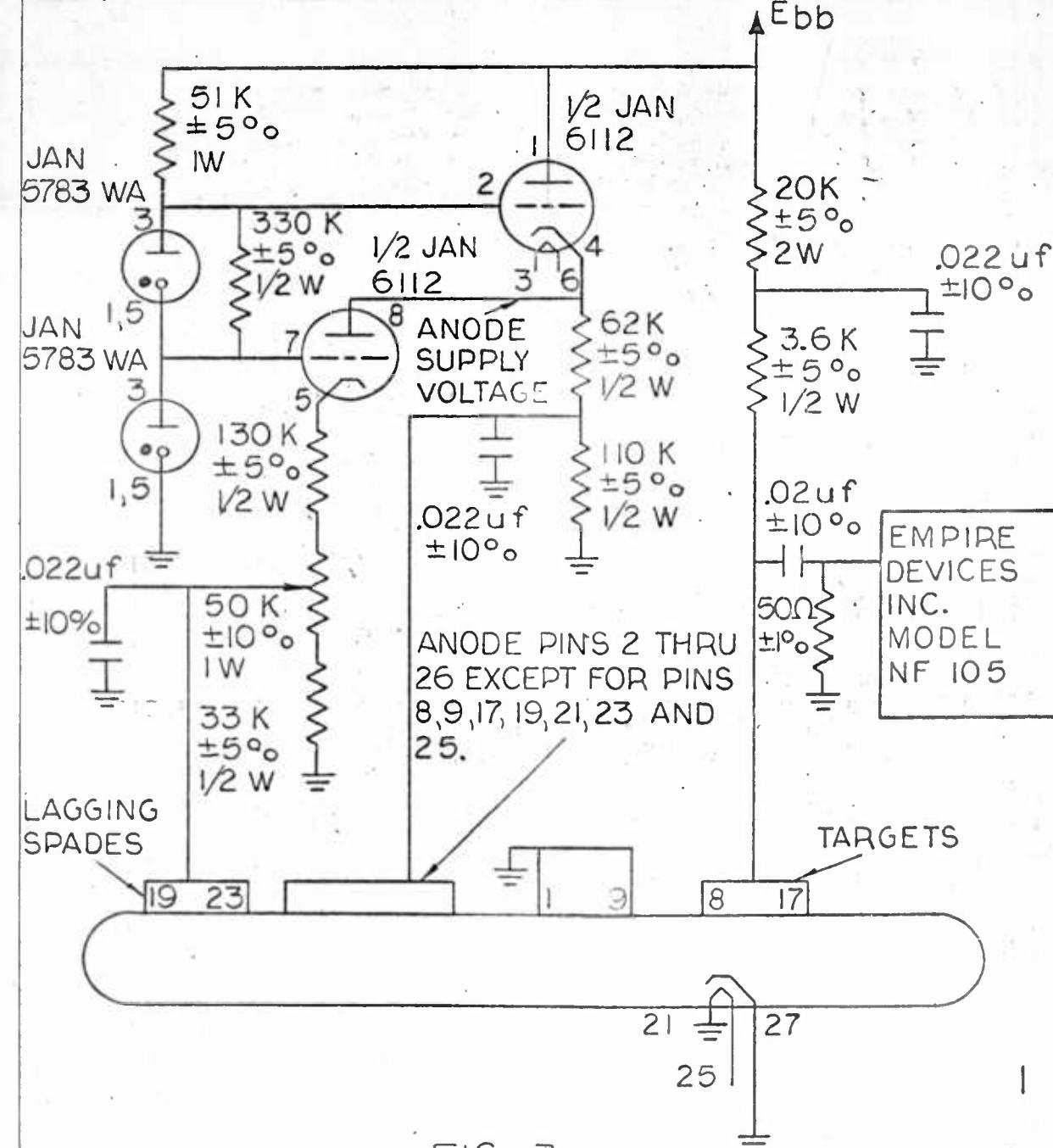


FIG. 3

MADE BY
Thomas E. Melvin 7/22/62
ISSUED
Aug 14 1962
FF-803-W2-P

APPROVALS
H. Wilfum
8/13/62

L.M.E.
UTICA, N.Y.

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PRINTS TO

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